NORTHERN ARIZONA UNIVERSITY

Department of Mathematics and Statistics Colloquium

Tuesday November 13

AMB 164 4:00 pm

# Data Science in Action: Connecting Biochemistry and Statistics

Dr. Robert Buscaglia

Northern Arizona University

**Abstract**

Modern statistics provides opportunities to investigate biochemical processes beyond that of classical studies. A series of studies will be presented that apply modern computational methodologies to improve upon traditional experimental chemistry. The core of these studies is three key aspects that are needed for the furtherance of data science: Integration, Innovation, and Dissemination. Full-spectra thermal denaturation profiles represent a modern experimental chemistry technique that is underutilized due to complexity in attaining thermodynamic results. Analytical models for thermodynamic characterization of biomolecule denaturation are developed and presented. New approaches to Differential Scanning Calorimetry baseline approximations will also be discussed; analytical models are constructed with the potential to not only predict traditional Gibbs free energy deconvolutions, but simultaneous estimation of heat capacity changes and thermal expansion coefficients often overlooked within the literature. The final set of projects is centralized around the development and utilization of new machine learning algorithms. The ESFuNC algorithm is discussed and its potential to improve classification studies involving multivariate functional data; per-pixel technology and the estimation of boosting ensembles through logistic regression is introduced. Clinically relevant applications and a series of studies resulting from these machine learning algorithms will be presented. The goal of the seminar is to demonstrate the integral nature of data science within the biological sciences, highlighting the current evolution of traditional studies occurring through the application of modern statistical approaches.

Refreshments at 3:45